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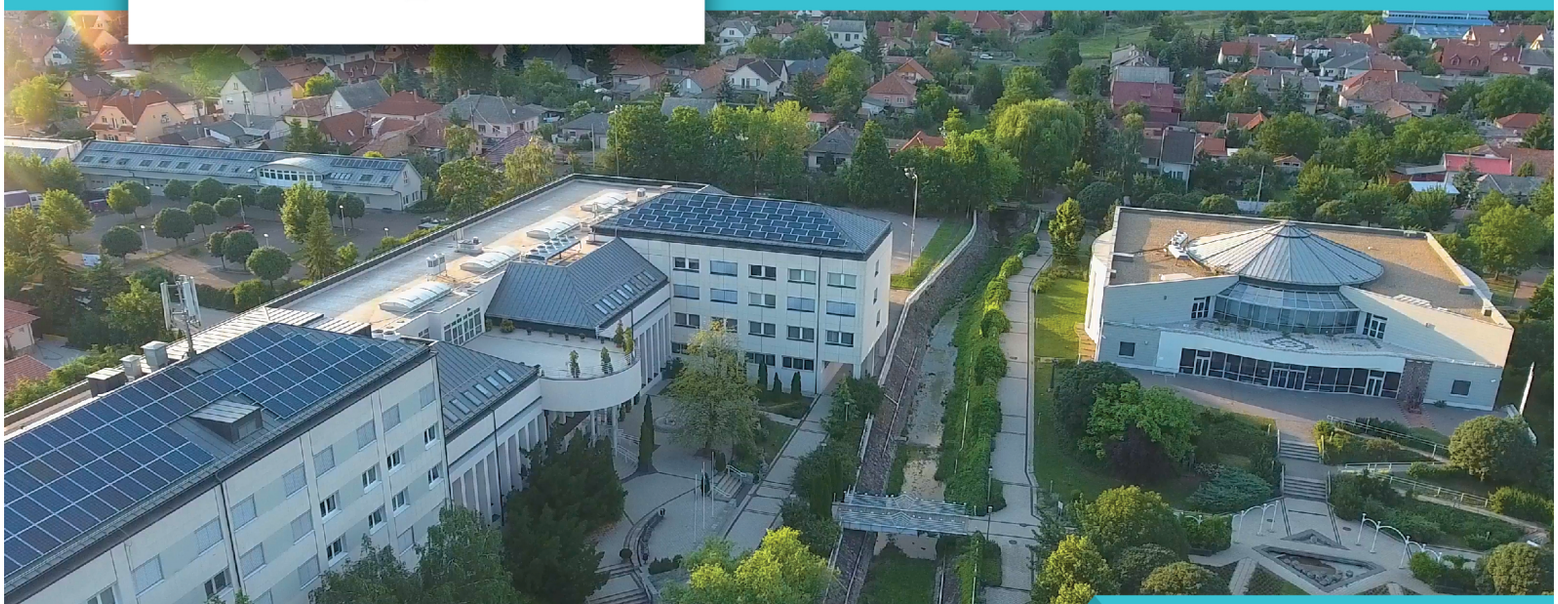

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ASSESSING LANDSCAPE CHANGES ON TIHANY PENINSULA TO PROMOTE SUSTAINABLE LAND USE

A TIHANYI-FÉLSZIGET TÁJKÉPI VÁLTOZÁSÁNAK ÉRTÉKELÉSE A FENNTARTHATÓ TÁJHASZNÁLAT ELŐMOZDÍTÁSÁHOZ

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Nagy-Valéria

Összefoglalás

A fenntartható tájhasználat a táji adottságokhoz történő alkalmazkodásban, a táj adta lehetőségek helyes felismerésében és ésszerű használatában rejlik. Ilyen módon a tájökológia jelentős potenciált hordoz magában, hogy elősegítse a fenntarthatóságot az ember és a természet szimbiózisában.

A tájváltozás – mint a környezeti komplexitás egyik legfontosabb folyamata – tanulmányozásának alapja lehet a történeti elemzés (Farina 2000). A bemutatott példában (Magyarországon a Tihanyi-félszigeten) a természeti adottságokhoz alkalmazkodó tájhasználat – különös tekintettel a mezőgazdálkodásra – jelentősen megváltozott az utóbbi több mint egy évszázad alatt. A mezőgazdálkodás a XX. század elején még nem vette figyelembe a táji adottságokat: az emberi jelenlét és beavatkozás jelentősen átalakította a Tihanyi-félsziget termőföldjeit. Nagy mértékben megnövekedett a beépített területek aránya, és elsősorban a szántók, szőlők alatt felgyorsult a talajpusztulás. A mezőgazdaság intenzifikálása kevésbé heterogén területet eredményezett, ezáltal csökkentve a mozaikosságot.

A félsziget táj- és természet-megőrzési célú védetté nyilvánításával a terület ökológiai adottságainak jobban megfelelő gazdálkodás kialakítására nyílt lehetőség, amely a talajadottságokhoz is jobban illeszkedő, kisebb mértékű mezőgazdasági hasznosítást jelent. A természetvédelem az eredeti ökológiai adottságoknak megfelelően visszaállította a lecsapolt területek vízborítását, visszatelepítette a hajdani nagyobb kiterjedésű erdőfoltokat és gondozza a szárazgyepeket. Jelenleg a terület lakosságának a mezőgazdálkodás mellett az idegenforgalomból származik a jövedelme, amely azonban károsít(hat)ja a félsziget védett értékeit és talajait. Megállapítható, hogy a jelen állapot jelentős táji- és természeti értékeket stabilizált vagy újított meg, vagyis a tájhasznosítás a fenntarthatósági kritériumok adta keretek között történik, azonban a szakszerű monitoring-tevékenység – a jól megválasztott tájjellemzők segítségével – elengedhetetlen az okszerű, tartós tájhasználathoz. A jövőben tehát a tájökológia, a komplexitáselmélet, valamint a fenntarthatóság tudományának interdiszciplináris integrációjára lesz szükség.

Kulcsszavak: Tihanyi-félsziget, táji adottságok, tájhasznosítás, fenntarthatóság

JEL-kód: Q15

Abstract

Sustainable land use is ensured by adaptation to the landscape, the right recognition of landscape options and rational land use. In this way the landscape ecology has a high potential to contribute to sustainability in the interactions of people and nature.

Historical analysis can be the basis of a landscape evaluation and studying landscape change – as one of the most important process of environmental complexity (Farina 2000). In the represented example (Tihany Peninsula in Hungary) the use of land adapted to natural conditions – with special regard to agriculture – has changed significantly in the last over a century. Agricultural use did not take into account landscape conditions at the beginning of the twentieth century: human presence and intervention have significantly transformed the lands (and soils) of Tihany Peninsula. The proportion of built-up areas has increased considerably, and soil degradation has been accelerated mainly in arable fields and vineyards. The intensification of agriculture produces a less heterogeneous area, thus decreasing the diversity of the land mosaic and it's spatial complexity.

By declaring the peninsula to be protected for landscape and nature preservation, it was possible to create a better adapted farming activity to the ecological conditions of the area, which means also less agricultural use, and is more suited to soil conditions. The nature conservation restored the water cover of the drained areas in accordance with the original ecological condition and helped the reforestation and manages dry grasslands. At present, the income of the population of the area comes from agriculture and also from tourism, but this activity also damages (can damage) the protected values and the soils of the peninsula. It can be stated that the present state has stabilized or renewed significant landscape and natural values, so land use is based on the sustainability criteria. However, the good monitoring activity – by well-chosen landscape features and markers – is indispensable for reasonable, long-lasting land use. In the future, interdisciplinary integration of landscape ecology, complexity theory and sustainability science will be needed.

Keywords: Tihany Peninsula, landscape, land use, sustainability

Code: Q15

Introduction

The natural factors involved in the formation of landscapes may need millions of years to create typical landscapes. However, man's social, economic, and land-use activities can, in a short time, radically change all of this. Utilization of the landscape features is sustainable in the long run only if we recognize the opportunities offered by the landscape, i.e. the landscape potential, and we adapt to its limits (Jianguo 2013). According To The National Landscape Strategy, One Of The Pillars Of The Vision Of Hungarian Landscapes Is That The Use Of Environmental Elements That Define The Landscape Is Sustainable And Integrated (Cumming 2011). However, historical times, traditions and practices leave their mark on this, so land use is constantly changing: adapting to the characteristics of the landscape, and sometimes destroying them. The degradation of landscape elements in many cases slows down the regeneration of landscapes, making unfavorable processes irreversible on a human scale, thus limiting later land use.

In our research, the Tihany Peninsula was chosen to be our sample area, because here it is easy to study the relationship of the three elements of nature-society-agriculture (the landscape use trilemma) and their effect on each other. Our main objective was to analyze the economic structure of the natural conditions and the society using it. Our study presents the factors involved in the change of the agricultural landscape, their effect on one another, and ultimately the change of the Tihany landscape.

Characteristics of the Balaton Riviera microregion and the Tihany Peninsula

The Tihany Peninsula is part of the Balaton Riviera microregion. This region is located in Veszprém county, with an area of 159 km^2, of which the peninsula is 13 km^2. Works on the evaluation of the microregion (Marosi and Szilárd 1975, Marosi és Somogyi 1990, Dövényi 2010) describe it as a land rich both in natural resources and cultural and agricultural traditions. The natural treasures of the Tihany Peninsula were discovered by the larger public at the beginning of the 1900's. The famous Balaton-explorers of the era played an important role in the development of tourism, attracting both professional and public attention to the increasingly popular peninsula (Cholnoky 1928, 1943).

The microregion is characterized by a lithosphere of very diverse age and quality. The terrain is probably the result of Pannonian abrasion and Pleistocene planning. Contiguous groundwater levels could be formed on the valley floor and on the edge of the lake, usually 2-4 m deep. The microregion has a moderately warm – moderately dry climate. Average annual temperature is 10.2-10.5 °C but it reaches 10.7 °C near the town of Tihany. Annual rainfall is 550-600 mm Northeast from Tihany, while it is 600-640 mm Southwest from it. The climate is equally suitable for arable and horticultural crops, vineyards and fruit cultures. The microregion belongs to the Balaton floristic district (*Balatonicum*). The forestry areas are mostly covered with sclerophyllous trees, less often with pine forests. In addition to agricultural production, orchards also play an important role, while the microregion is part of the world famous Balaton wine region. Topsoil is mainly forest soil, but the proportion of rocky soils is also significant. Lithosoils and alluvial meadow soils play a more subordinated role in the region. Due to the special features of the countryside and the favorable climatic conditions, holiday and tourism are of the utmost importance, the microregion is one of the most visited tourist areas in Hungary (Dövényi 2010).

Aspects of landscape/nature influencing the agriculture of the Tihany peninsula

One of the inhibitory factors of agriculture is the solid rock close to the surface. This allows such a thin fertile soil that neither grazing, nor growing plants is possible. Such rocks in the study area are basaltic tuff, geyserite and – in smaller spots – limestone (Láng 1970). These rocks also have an impact on the terrain and the angle of slopes, since volcanic activity has lifted the rocks from the surface. The thin layer of fertile topsoil and the steep angle of slope – as well as the resulting risk of erosion – are characteristic of many areas on the peninsula. Thin soils usually follow the line of mountain peaks, but they also occur on basaltic tuff saturated with silica or lime on the geyser field.

Excess water creates (may create) a two-phase system in the soil, and the constant or intermittent reductive conditions that are emerging influence crop production. Areas with excess water, especially in the coastal line, in the lakes and on the neck of the peninsula, hinder the cultivation of land.

Soil conditions fundamentally determine the agricultural potential of an area. The peninsula is located at the borders of woodland and chernozem soils, thus these two main types are dominant. However, soil mantle is also characterized by rocky soils with diverse appearance, as well as soils with excess water. Soil studies have shown that extreme clay or sand content, salinisation or acidification in the peninsula do not inhibit agricultural cultivation. At the same time, shallow soil, extreme water management and propensity to erosion may exclude intensive soil use (Barczi 2000).

Therefore the factors that inhibit agriculture on the peninsula are the shallow layer of soil (solid rock close to the surface), extreme water effects and the tendency for erosion. By mapping all these factors, areas that are unsuitable for agriculture can be filtered out (Barczi *et al.* 1999). According to the above, the mountain range around the peninsula, the mosaic-like, variegated terrain, the area around the lakes and the marshlands are unsuitable for agricultural land use. However, there is no obstacle to cultivation in areas with chernozem brown woodland soil, nor in the basin-like areas free from excess water. Also, the woodland soil of more tranquil, slightly sloping forests is also suitable for plant production.

The history of agriculture

Summarizing the records of the time, it can be said that in the 1700's a "work-centric lifestyle adapted to the order of nature" was typical of Tihany. The small number of population mainly depended on farming for their livelihood, the number of craftsmen was low. 76.8% of the population lived on farming. At that time the national average was 67.5% (Kovacsics & Ila 1988). In addition to agriculture, fisheries and vineyards provided sources of livelihood to the inhabitants of the village.

On the scattered small parcels, the people of Tihany used traditional peasant farming. The majority of the holdings were under 2.5 ha in area (Sörös 1911). Crops were not sold on the market but consumed by the locals themselves. The use of the forested area of the peninsula mainly consisted of utilizing by-products (feeding pigs on acorn; gathering mistletoe, plant galls and smoketree; making potash) as there was no market for lumber because of the distance of railways and waterways (Magyar 1986). The amount of natural resources and the functions of land use were still closely linked. This long established balance started to disintegrate because of the increasing demand of the growing population, since there was only two ways to provide more arable land around Tihany: either by deforestation or by the reduction of pastures (Magyar 1986). Previously, animal husbandry had only been used to satisfy the locals' own needs, while more intensive farming was not possible on the small peninsula. However, as a result of the growing population from the 1700's, the number of livestock started to increase (Kovacsics & Ila 1988). This caused a short-term increase in the percentage of grassland areas, which led to a further decline in forest areas.

In the 19th century, forest grazing played a significant role in feeding, which contributed greatly to the destruction of the Tihany peninsula (Magyar 1986). Later, overgrazing by exaggerated sheep farming caused harm in the natural environment (Penksza *et al.* 1994).

By the 1900's, woods became worthless for forestry, while at the end of the nineteenth century, a phylloxera epidemic fell on the vineyards (Veszprém megyei múzeumok közleményei 10.). Cholnoky (1928) reported that vineyards destroyed by phylloxera were replaced by corn and potato fields. From these areas the wind ripped the soil until the underlying basaltic tuff was exposed.

Until the 20th century, grapes and fruit were always produced together. The number of almond trees exceeded 6,000 in the early 1900's. The peninsula was then a "real El Dorado" of almond trees, being the largest almond producer around the whole Balaton (Jankó 1902). By 1945, the number of fruit trees significantly dropped. In his study on the National Park, Csordás (1947) proposed planting strawberries, establishing distilleries, and planting as many fruit trees as possible. After the war, fruit production grew on the peninsula. Within the Tihany Management Committee, the Fruit Action Action Committee was established in 1964, which supervised further plantations (Forró 1969-70).

Thus, in the old landscape use, besides fishing, gardening and reed harvesting, the expanding agriculture secured livelihood for the population (Jankó 1902). By the turn of the century, the peninsula became barren, its forests disappeared, the vines died off, and their re-planting lacked the necessary capital.

Tourism that began in the 1920's and 1930's radically changed the structure of society and the economy. There was a continuous flow from the agricultural sector to the commercial sector (Kovacsics & Ila 1988). In 1926, a major change in farming was the creation of the Lavender Field (Földbirtok rendezés 1947). According to Kovacsics & Ila (1988), Tihany is one of the most important herbal plants in the Hungarian pharmaceutical industry, where, besides lavender, other herbs are also produced, including foxglove, wild celery and thyme. Lavender fields, created for the plant's essential oil, were later supplemented by almond trees, which hindered cultivation. In the sixties, the cultivation of lavender was discontinued. Today, however, new lavender fields are established on the peninsula.

After World War II, the emerging State Farms focused primarily on the re-establishment of vineyards. As for the historical wine regions, Decree 1897 of the Hungarian Royal Minister of Commerce grouped Tihany within the Badacsony wine region.

Decree 40/1977. (XI. 29.) on agriculture already classifies the vineyards of the peninsula as belonging to the Balatonfüred-Csopak wine region (Laposa 1988). Before the turn of the century, Tihany lacked the expertise needed for more advanced, more intensive farming. Few people knew how to manage grape and wine, their wines were not of high quality, therefore they produced wine mainly for their own needs (Balatonparti szociográfiák 1959). The tradition of vine-growing was renewed by the Badacsony State Farm in 1966 at the initiative of the National Nature Conservation Office as the director of the Tihany State Farm, first planting new red grape varieties (Blauer Portugieser, Blaufränkisch, and Medoc). The area at the time was 31.3 ha (Forró 1969-70). Red wines are still made from the vineyards near the Inner and Outer Lake, renewing the tradition of blue grape cultivation of the former centuries. At the same time – with regard to occupations – the number of primary producers decreased, the slow industrialization of the area (Balatonfüred Shipyard, etc.) increased the number of people employed in the industry, while tourism helped to increase the number of other occupations (Balatonparti szociográfiák 1959). The later development of the village was determined by the following factors: tourism, agricultural development, the exchange and transformation of the population, as well as the growth of both immigration and emigration. Nature and landscape conservation efforts have given new colors to land use.

As early as in 1941 and 1944, Cholnoky suggested that the peninsula could be turned into a National Park. In 1943 Cholnoky reported that the National Conservation Council was transform-

ing the peninsula into a "nature conservation area." Kenyeres reported in 1952 that the Landscape Protection Area had been created (Decision No. 392/1952 of the National Council for Nature Conservation). Protected areas were then 387.74 hectares, and today 1562 ha are protected, including the area of Aszófő, Örvényes and Füred. Nature and landscape protection further reduced the proportion of plow fields and pastures, while the area of forests increased, and the proportion of reeds started to increase again.

Changing agriculture: adaptation to the characteristics of the landscape?

The changes in the landscape use of the Tihany Peninsula can be evaluated in the light of the above. After analyzing the land use characteristics of three typical periods – the turn of the 20th century (1895), the turn of the 21st century (1995) and the recent past (2012) – (based on data published by the Central Statistical Office), the following changes can be summarized (Figure 1, Figure 2 and Figure 3).

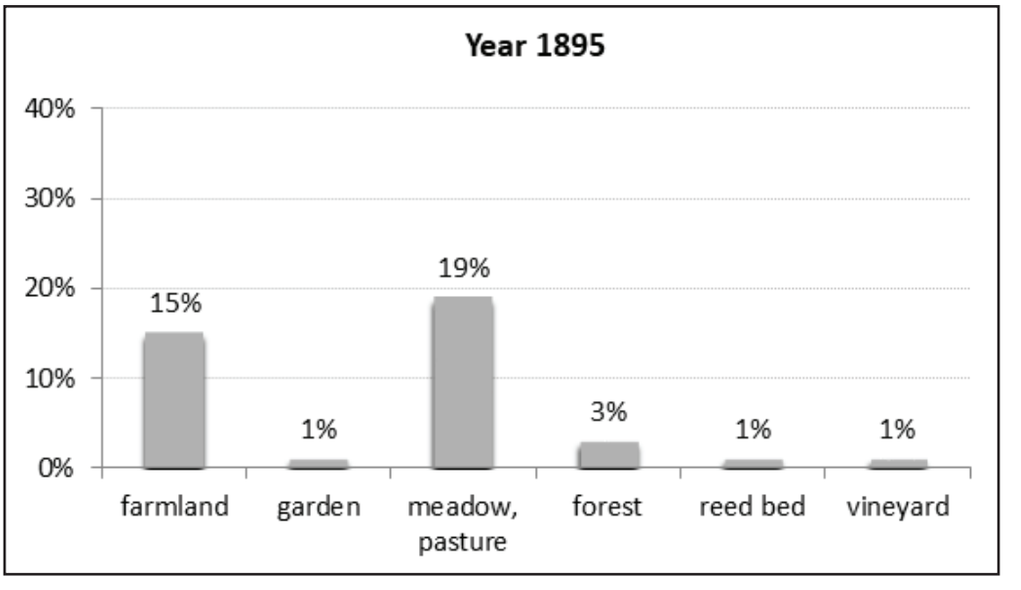

Figure 1. Land use of Tihany Peninsula in 1895

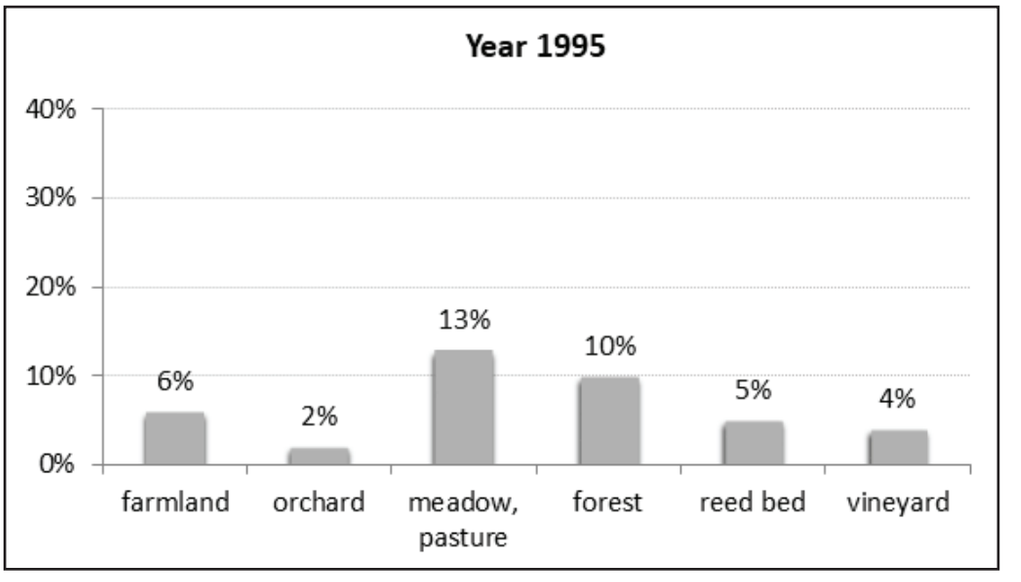

Figure 2. Land use of Tihany Peninsula in 1995

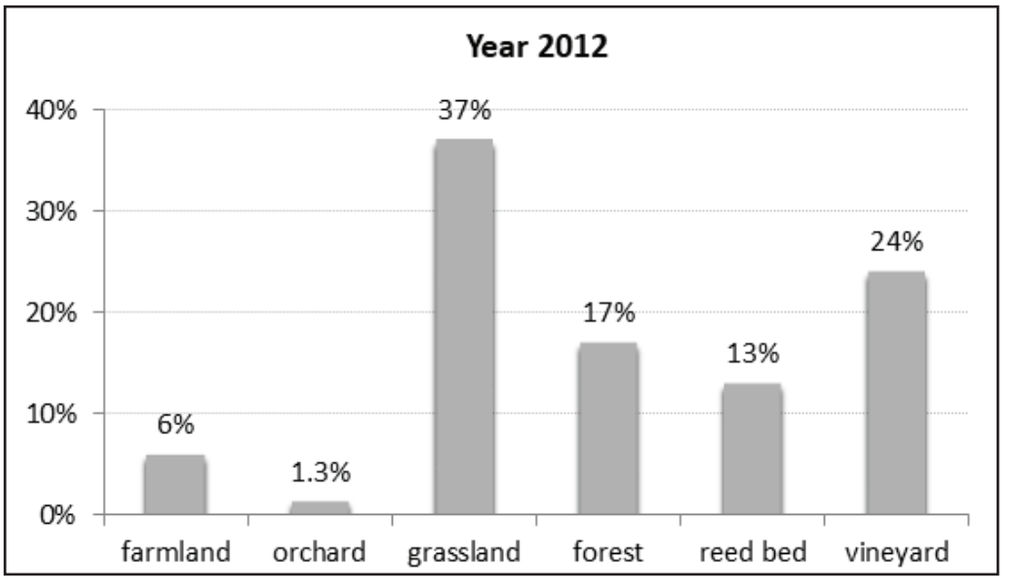

Figure 3. Land use of Tihany Peninsula in 2012

By the beginning of the 1900's, former forests had practically disappeared because of the advancement of agriculture, grazing, intensive land use and the destruction of vineyards. However, the erosion damage that occurred further deteriorated the already unfavorable soil conditions, so some parts of the land made it necessary to replant of forests for soil protection. This attempt can still be witnessed in some of the remaining black pine forests and other areas populated by non-native tree species. However, significant reforestation occurred after nature conservation changes with the establishment of the Landscape Protection Area, and the proportion of forests grew from 3% to 10%, not only in scablands, but also on brown woodland soils. This process has been steadily increasing over the past 20 years.

The increase of forests happened at the expense of arable land. At the beginning of the 20th century, larger arable lands (16%), partly due to the less favorable conditions (shallow layer of fertile soil, intensive erosion, etc.), partly owing to nature conservation efforts and intensifying tourism, decreased to about one-third and their proportion seems to be remaining the same. At present the more favorable woodland soils with thicker fertile layers and intermediate soils, as well as loess based soils are under field cultivation.

The phylloxera plague wiped out vineyards. However, grapes less susceptible to soil conditions have found their way in the farming structure and landscape use, due to the excellent climatic and microclimatic conditions. This process, after the Second World War with the establishment of the State Farm, and then after the 1989 political changes, increased the proportion of vineyards with the entrepreneurship and vigor of winegrowers. Currently, vineyards account for about a quarter of Tihany's land use. However, we should mention that the cultivation of vines has a significant erosion potential.

By studying grasslands and pasture areas, it can be concluded that in Tihany, still at the end of the 1900's, one-fifth of grasslands were used as pasture. Later the growth of forests and vineyards lowered this ratio, but, as a result of natural and landscape conservation efforts, as well as due to erosion and soil wear, the proportion of characteristic dry grasslands increased to 37%. Grazing is taking place in only a part of these, and the role of previously significant sheep farming is also reduced. At the same time, the introduction of the Hungarian gray cattle with nature and gene conservation aims into the local cattle population that has been decreasing because of tourism, brought about favorable changes, bringing new color to the multifunctional agricultural land use, helping the regeneration of grasslands, and also serving as a tourist attraction (Szabó *et al.* 2014; Zimmermann *et al.* 2016).

Conclusion

Overall, adaptation to natural conditions was typical of older land use, but growing demands and agricultural necessities had largely restructured the use of the Tihany peninsula by the early 1900's. More intense tillage and the advance of arable land have accelerated soil degradation in both favorable and unfavorable soils. However, the process was reversed not by the recognition of damage and the subsequent attempts to stop soil erosion, but first by the emergence of tourism followed by nature conservation efforts, and then the restoration of vineyards, which also contributed to the decline of arable land. By now, a more mosaic farming structure has developed, which is adapted more readily to natural conditions, and in which tourism, nature conservation and viticulture play the key roles. The proportion of arable lands and pasture areas (animal husbandry) is lower, the latter being partly due to nature conservation efforts.

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